

<https://helda.helsinki.fi>

Managing Allergic Rhinitis in the Pharmacy : An ARIA Guide for Implementation in Practice

Lourenco, Olga

2020-06

Lourenco , O , Bosnic-Anticevich , S , Costa , E , Fonseca , J A , Menditto , E , Cvetkovski , B , Kritikos , V , Tan , R , Bedbrook , A , Scheire , S , Bachert , C , Bialek , S , Briedis , V , Boussey , K , Canonica , G W , Haahtela , T , Kuna , P , Novellino , E , Samoliski , B , Schunemann , H J , Wallace , D & Bousquet , J 2020 , ' Managing Allergic Rhinitis in the Pharmacy : An ARIA Guide for Implementation in Practice ' , Pharmacy , vol. 8 , no. 2 , 85 . <https://doi.org/10.3390/pharmacy8020085>

<http://hdl.handle.net/10138/319186>

<https://doi.org/10.3390/pharmacy8020085>

cc_by

publishedVersion

Downloaded from Helda, University of Helsinki institutional repository.




This is an electronic reprint of the original article.

This reprint may differ from the original in pagination and typographic detail.

Please cite the original version.

Article

Managing Allergic Rhinitis in the Pharmacy: An ARIA Guide for Implementation in Practice

Olga Lourenço ^{1,*}, Sinthia Bosnic-Anticevich ², Elísio Costa ³, João A. Fonseca ⁴,
Enrica Menditto ⁵, Biljana Cvetkovski ², Vicky Kritikos ², Rachel Tan ², Anna Bedbrook ⁶,
Sophie Scheire ⁷, Claus Bachert ^{8,9,10}, Sławomir Bialek ¹¹, Vitalis Briedis ¹², Koen Boussey ⁷,
G. Walter Canonica ¹³, Tari Haahtela ¹⁴, Piotr Kuna ¹⁵, Ettore Novellino ¹⁶, Bolesław Samoliński ¹⁷,
Holger J. Schünemann ¹⁸, Dana Wallace ¹⁹ and Jean Bousquet ^{6,20,21,22}

- ¹ Faculty of Health Sciences and CICS—UBI, Health Sciences Research Centre, University of Beira Interior, 6200-506 Covilhã, Portugal
- ² Woolcock Institute of Medical Research, Faculty of Medicine and Health, University of Sydney, Sydney 2037, Australia; sinthia.bosnic-anticevich@sydney.edu.au (S.B.-A.); biljana.cvetkovski@sydney.edu.au (B.C.); vicky.kritikos@sydney.edu.au (V.K.); rachel.sze.tan@sydney.edu.au (R.T.)
- ³ UCIBIO, REQUIMTE, Faculty of Pharmacy and Competence Center on Active and Healthy Ageing (AgeUPNetWork), University of Porto, 4150 Porto, Portugal; emcosta@ff.up.pt
- ⁴ CINTESIS—Center for Health Technology and Services Research, Faculty of Medicine, University of Porto, 4200-450 Porto, Portugal; fonseca.ja@gmail.com
- ⁵ CIRFF, Center of Pharmacoeconomics, University of Naples Federico II, 80138 Naples, Italy; enrica.menditto@unina.it
- ⁶ MACVIA-France, 34295 Montpellier, France; anna.bedbrook@inserm.fr
- ⁷ Pharmaceutical Care Unit, Faculty of Pharmaceutical Sciences, Ghent University, 9000 Ghent, Belgium; Sophie.Scheire@ugent.be (S.S.); koen.boussey@ugent.be (K.B.)
- ⁸ Upper Airways Research Laboratory, ENT Dept, Ghent University Hospital, 9000 Ghent, Belgium; claus.bachert@ugent.be
- ⁹ International Airway Research Center, First Affiliated Hospital Guangzhou, Sun Yat-sen University, Guangzhou 510275, China
- ¹⁰ Department of Medicine Solna, Immunology and Allergy Research Unit, Karolinska Institute, 171 77 Stockholm, Sweden
- ¹¹ Department of Biochemistry and Clinical Chemistry, Faculty of Pharmacy with the Division of Laboratory Medicine, Warsaw Medical University, 02-091 Warsaw, Poland; slawomir.bialek@wum.edu.pl
- ¹² Department of Clinical Pharmacy, Lithuanian University of Health Sciences, 44307 Kaunas, Lithuania; vitalis.briedis@lsmuni.lt
- ¹³ Personalized Medicine Clinic Asthma & Allergy, Humanitas University, Humanitas Research Hospital, 20089 Rozzano MI, Italy; giorgio_walter.canonica@hunimed.eu
- ¹⁴ Skin and Allergy Hospital, Helsinki University Hospital, University of Helsinki, 00100 Helsinki, Finland; tari.haahtela@haahtela.fi
- ¹⁵ Division of Internal Medicine, Asthma and Allergy, Barlicki University Hospital, Medical University of Łódź, 90-419 Łódź, Poland; piotr.kuna@umed.lodz.pl
- ¹⁶ Department of Pharmacy, University of Naples Federico II, 80138 Naples, Italy; etторе.novellino@unina.it
- ¹⁷ Department of Prevention of Environmental Hazards and Allergology, Warsaw Medical University, 02-091 Warsaw, Poland; boleslaw.samolinski@wum.edu.pl
- ¹⁸ Department of Health Research Methods, Evidence, and Impact, Division of Immunology and Allergy, McMaster University, Hamilton, ON L8S 4L8, Canada; holger.schunemann@mcmaster.ca
- ¹⁹ College of Allopathic Medicine, Nova Southeastern University, Fort Lauderdale, FL 33314, USA; drdanawallace@gmail.com
- ²⁰ Centre Hospitalier Universitaire de Montpellier, 34295 Montpellier, France; jean.bousquet@orange.fr
- ²¹ Charité—Universitätsmedizin Berlin, corporate member of Freie Universität Berlin, Humboldt-Universität zu Berlin, 10117 Berlin, Germany
- ²² Comprehensive Allergy Center, Department of Dermatology and Allergy, Berlin Institute of Health, 10178 Berlin, Germany

* Correspondence: olga@fcsaude.ubi.pt; Tel.: +351-275-329-009

Received: 15 April 2020; Accepted: 15 May 2020; Published: 16 May 2020



Abstract: The paradigm of how we manage allergic rhinitis is shifting with a growing understanding that it is a complex process, requiring a coordinated effort from healthcare providers and patients. Pharmacists are key members of these integrated care pathways resolving medication-related problems, optimizing regimens, improving adherence and recommending therapies while establishing liaisons between patients and physicians. Community pharmacists are the most accessible healthcare professionals to the public and allergic rhinitis is one of the most common diseases managed by pharmacists. Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines developed over the past 20 years have improved the care of allergic rhinitis patients through an evidence-based, integrated care approach. In this paper, we propose an integrated approach to allergic rhinitis management in community pharmacy following the 2019 ARIA in the pharmacy guidelines.

Keywords: allergic rhinitis; community pharmacy; pharmacist

1. Introduction

Allergic rhinitis (AR) is the most common form of noninfectious rhinitis and is one of the most common chronic diseases globally [1–4]. Cardinal symptoms of AR include rhinorrhea, nasal congestion, sneezing and nasal itching, and they are often spontaneously reversible or controlled by adequate treatment [5]. These symptoms have a significant impact on work and school productivity [6,7], decreasing general health-related quality of life [8,9]. Clinical evaluation and the implementation of a clinical management plan that identifies specific risk factors and determinants of low adherence to treatment can effectively lead to symptom control and an improvement in the quality of life [5]. However, many patients underestimate their condition [10] or experience fatigue due to multiple suboptimal encounters with healthcare providers [11] and delay appropriate treatment. Moreover, self-medication for the treatment of AR symptoms is common [12], with most patients self-managing their AR with few interactions with their physician [13,14]. Furthermore, AR patients are often dissatisfied with their treatment and search for nonhealthcare professional advice for ways to manage their condition [11]. Finally, adherence to prescribed treatment in AR is low [15,16].

These considerations highlight the importance of effective, evidence-based advice and support being provided to AR patients at the community pharmacy level. The need for greater healthcare professional involvement is particularly important for people with other comorbidities, as AR is frequently associated with asthma and/or conjunctivitis [17]. Insufficient AR control can result in disease progression and affect asthma control [5]. Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines, developed over the past 20 years, have improved the care of AR patients through an evidence-based, integrated care approach [5,18–20]. Specific guidelines for community pharmacies were first issued in 2004 [21] and have recently been updated to encompass integrated care pathways and digital solutions [22].

Initiated in 1999, in collaboration with the World Health Organization (WHO) [19], ARIA has developed into MASK (Mobile Airways Sentinel Network) [23–25], the IT solution of ARIA. In 2014, on behalf of the European Innovation Partnership on Active and Healthy Ageing (EIP on AHA), AIRWAYS ICPs (Integrated Care Pathways for airway diseases) was initiated [26,27]. The objective was to launch a collaboration to develop multisectoral care pathways (ICPs) for chronic respiratory diseases in European countries. MASK was proposed to be the mHealth strategy of AIRWAYS ICPs. MASK was developed as a proof-of-concept for multimorbid chronic disease care across the life cycle [28,29] and is scaled up using the EIP on AHA strategy [30,31]. It is a Good Practice of DG Santé [25,32] (digitally enabled, integrated, person-centred care for rhinitis and asthma) for change management [33].

MASK involves all stakeholders including professionals and patients, as well as policymakers and healthcare authorities.

It is now critical to put these guidelines into practice in the community pharmacy setting. AR is a complex chronic condition, and implementing clinical practice guidelines for AR management in the community pharmacy is particularly important, as most patients do not consult a medical practitioner when selecting medication for their AR [5,20,34]. The pharmacist's role must, therefore, encompass a broad range of management issues including confirmation of the presence of AR, treatment selection, patient self-management, long-term monitoring and patient support.

2. Is this Allergic Rhinitis?

With the high level of self-diagnosis, the ability of pharmacists to identify AR is critical. In an Australian study of patients with moderate asthma, 46% of those who also had AR did not have a physician diagnosis [14]. Moreover, in a study in Australian community pharmacies, 37% of patients purchasing AR medication did not have a physician diagnosis [35]. To confirm the presence of AR, the pharmacist needs to verify the patient's symptoms and exclude alternative conditions such as the common cold or other more severe illnesses [36] which may require immediate referral to a physician [37,38]. The possibility of drug-induced rhinitis (e.g., nonsteroidal anti-inflammatory drugs, alpha-antagonists and alpha-2 agonists) should be assessed, as medication adverse effects will not respond to therapy. Table 1 provides a set of simple questions that may help the pharmacist in differentiating allergic-rhinitis-like symptoms from other causes.

Table 1. Questions helping to identify allergic rhinitis and/or allergic conjunctivitis.

Questions Helping to Identify Allergic Rhinitis
What is your main symptom? (Check for rhinorrhea, sneezing, itchy nose, nasal congestion, watery or itchy eyes.)
How long have you had these symptoms?
Do you have the symptoms all the time or do they come and go?
Are you aware of anything that seems to bring the symptoms on, such as being outdoors, pollen seasons, contact with animals, something you handle at work or at home?
Has a doctor ever diagnosed you with hay fever, allergic rhinitis, or asthma?
Is your nasal discharge clear and watery? (purulent discharge suggests infection)
Are you experiencing any wheezing or shortness of breath? ("Yes" may indicate asthma.)
Do you have an earache or any pain in your face? ("Yes" may indicate otitis media or sinusitis.)
Questions helping to identify allergic conjunctivitis
What is your main symptom? (Check for bilateral eye symptoms, eye itching, watery eyes, red eyes)
Do you have allergic rhinitis?
Do your eyes burn? ("Yes" may indicate disease other than allergic rhinitis)
Do you have dry eyes? ("Yes" may indicate disease other than allergic rhinitis)
Do you have photophobia? ("Yes" may indicate disease other than allergic rhinitis and the patient should be referred to a doctor)

AR patients may have multiple nasal symptoms (rhinorrhea, sneezing, nasal pruritus and/or congestion), a large percentage have ocular symptoms (ocular tearing, redness and pruritus) and many patients also have asthma [39]. Although nasal congestion is an AR symptom, it is unlikely to be of allergic origin when it occurs as a single symptom. The issue may be, however, that patients do not necessarily realise that they are experiencing more than one symptom [35]. Loss of smell, facial pain or postnasal drip are more often associated with nonallergic rhinitis [40] or rhinosinusitis. Patients presenting with unilateral symptoms, recurrent nasal bleeding, clear rhinorrhea which is

largely unilateral and worse on bending forward, or purulent rhinorrhea, especially if accompanied with fever, should be referred to a physician [38].

Ocular symptoms are commonly associated with nasal symptoms in AR [41] and can be evaluated using simple questions. However, some forms of conjunctivitis require a referral to a physician, especially if they are unilateral, or if photophobia, bleeding or a burning sensation are present (Figure 1).

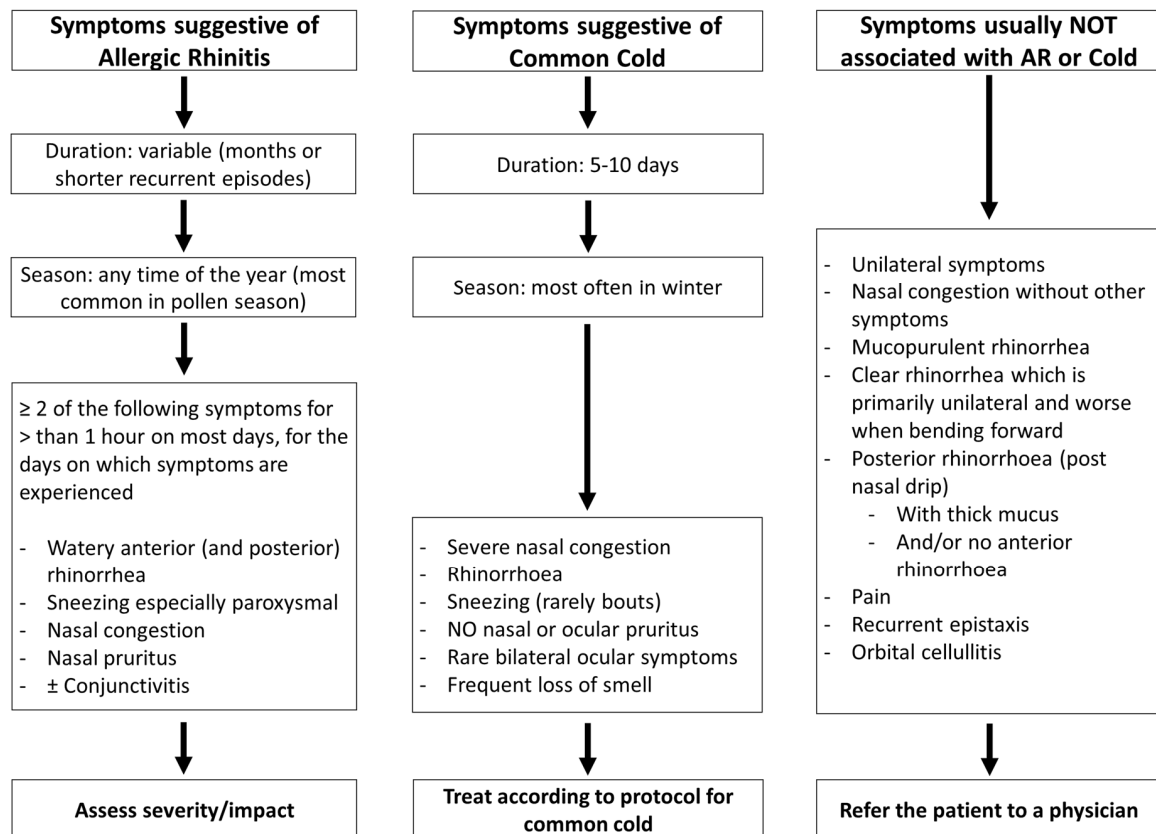


Figure 1. Recognising allergic rhinitis in the pharmacy (adapted from [21,22]). In Figure 1, some of the items not associated with allergic rhinitis symptoms refer to rhinosinusitis and other diseases that need to be checked during differential diagnosis.

The co-existence of poorly controlled rhinitis is associated with poor asthma control in adults, adolescents and children [42–44] and is a major risk factor for asthma exacerbations. If the patient presents asthma symptoms in addition to rhinitis symptoms, they should be referred to a physician (Figure 2). Therefore, it is critical to consider asthma in the evaluation of AR.

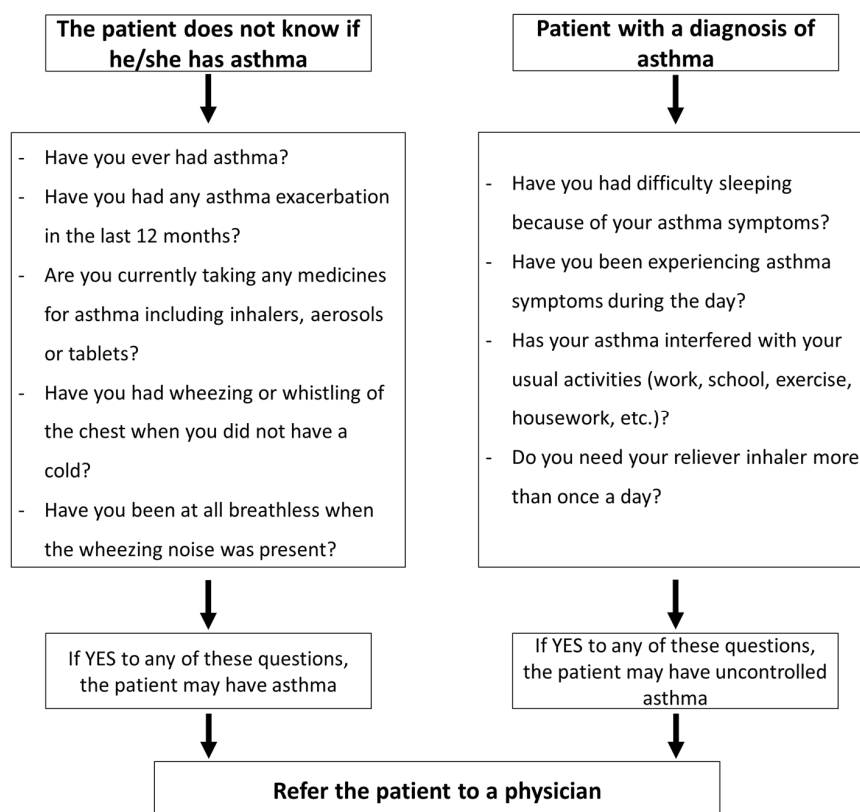


Figure 2. Screening of asthma in rhinitis patients in the pharmacy (Adapted from [22]).

3. Assessing the Severity of Allergic Rhinitis: Tools for the Pharmacist

The ARIA guidelines propose a classification of AR based on symptom control, quality of life and daily impact as well as duration [5,18,20]. Allergic rhinitis may be intermittent or persistent, but this does not impact on the treatment to be recommended except for its duration. The ARIA guidelines base treatment recommendations on the impact of symptoms on day-to-day living [22,25,45].

Computer-based pharmacy systems have been used globally for decades, but they refer mainly to drug-drug interactions, adverse effects and drug allergy [46–49]. In 2012, a computational pharmacy decision support system (PDSS) for allergic rhinoconjunctivitis was tested in German community pharmacies. Its usefulness was proved in patient assessment and correct evaluation before self-medication counselling [50]. A newly developed computerized decision support system (e-CDSS) might be useful in identifying patients with a likelihood of having AR and in proposing the most effective treatment [51].

Symptom severity in AR can be measured using total symptoms score, but this is not a simple test. The visual analogue scale (VAS) is a simple, validated quantitative measure, which can be used in a wide variety of languages and which is responsive to change [52]. The VAS uses patient-reported assessments of the intensity of the main symptoms. A VAS for nasal symptoms (range 0–10) is proposed in the treatment flowchart (Figure 3) to assess control before and after some days of treatment. A VAS for ocular symptoms may also be used and can complement the VAS for nasal symptoms [53].

“How much are your nose symptoms bothering you today?”

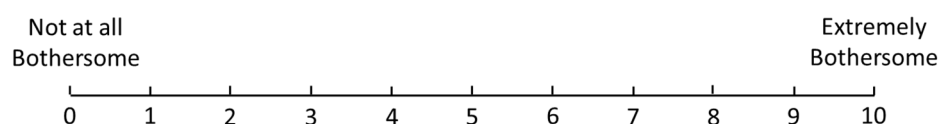


Figure 3. Determining the impact of allergic rhinitis symptoms.

For patients with simultaneous asthma and rhinitis, a previous study conducted in community pharmacies showed that a simple self-assessment questionnaire, the Control of Allergic Rhinitis and Asthma Test (CARAT) [54], can help the pharmacist to identify patients with uncontrolled AR and asthma, which is the first step in improving symptom control [55].

4. Treatment of Allergic Rhinitis in the Pharmacy

Minimizing the impact of AR symptoms is the most important endpoint for the pharmacist, and is used to initiate treatment and maintain appropriate medication/strategies over time. AR symptoms can be used to evaluate the efficacy of the treatment and the patient's quality of life. By evaluating the impact of AR on day-to-day living, a VAS (as per Figure 3) can be used. While a majority of AR patients self-select their medication, the role of the pharmacist is crucial as AR patients who obtain professional advice from a pharmacist have a higher chance of choosing guideline-recommended medication [37].

AR treatment encompasses three different aspects—(1) avoidance of allergen exposure; (2) pharmacotherapy; and (3) allergen-specific immunotherapy (AIT). Pharmacists have an opportunity to deliver patient education in terms of avoidance of allergen exposure, disease information, as well as medication recommendations and use, including nasal medication administration and adherence [45].

(1) With regard to allergen avoidance and environmental control, these strategies can diminish AR symptoms, reducing the need for medication [18]. However, this approach is only feasible when allergens have been identified, and its exposure can be reduced effectively; which is nearly impossible for polysensitized patients and patients with pollen allergy during the respective pollen season [56]. Nevertheless, the use of the pollen app should be suggested to patients if available for the geographic region.

(2) When it comes to medications, guidelines consider a range of medications that can be used in the treatment of AR, based on symptom severity, duration and on the impact of symptoms on day-to-day living [5,34,57–60]. Medications primarily include intranasal corticosteroids (INCS), intranasal and oral antihistamines, leukotriene antagonists, intranasal cromoglicate, intranasal and oral vasoconstrictors and nasal washing. It is important to note that medication lists vary widely between countries.

(3) AIT helps to reduce the severity of AR symptoms by modifying the immunological response and inducing tolerance to the causative agent [45]. Products for AIT are available in pharmacies of many countries and the pharmacist can be an important participant in the management of AIT, providing monitoring for adverse effects and support for adherence [45].

INCS are the most effective treatment for AR, especially in patients with co-existing asthma [19,34,61] and are considered nonprescribed medication in many countries. All of the available intranasal corticosteroids are efficacious in controlling symptoms, although mometasone furoate, fluticasone propionate and fluticasone furoate are generally preferred [62] because they have negligible bioavailability and less potential to cause side effects. Pricing, cultural barriers, specific country regulations and availability, and even patient preference [63,64] for oral vs. nasal treatment all mean that INCS may not necessarily be available or the most desirable treatment for all patients, such as those with a predisposition to high intraocular pressure (glaucoma). Oral H₁-antihistamines are still largely used by many patients and may be sufficient to control mild AR. The intranasal combination of azelastine and fluticasone propionate is available OTC in New Zealand. Therefore, a broad understanding of the local context should be taken into consideration when recommending treatment.

Studies reporting interventions targeting nasal inhaler medication administration techniques for AR management are missing. However, the results of bronchial inhaler community-pharmacy interventions used for COPD and asthma have been encouraging [65–68]. As such, patients should be counselled and evaluated on the appropriate administration technique for intranasal medication, especially in avoiding the nasal septum. In avoiding the nasal septum, medication efficacy is increased and the risk of local adverse effects such as nasal crusting and bleeding is reduced which is more likely to lead to improved compliance to treatment [69].

Some INCS reduce eye symptoms as well as nasal symptoms, although the combination of INCS and ocular antihistamines is more effective on both nasal and ocular symptoms [70–72]. Moreover, there are topical drugs for eye symptoms [18].

However, none of the medications currently used to treat AR can cure this condition and many patients still suffer from uncontrolled disease either because they are not adherent to treatment or medications cannot fully control the disease [36]. As such, the pharmacist needs to help patients self-manage their condition by determining the most effective treatment to control their symptoms from the options available, with consideration of their needs and preferences. In AR, the main goal of treatment should be improving the patient's wellbeing and daily functioning. In some selected AR patients, allergen-specific immunotherapy can be a valuable alternative.

Figure 4 presents a flowchart based on VAS to help pharmacists determine which medication is indicated for individual patients experiencing AR symptoms. This algorithm should be adapted to the regulations, needs, price of medications and cultural barriers of each country or region.

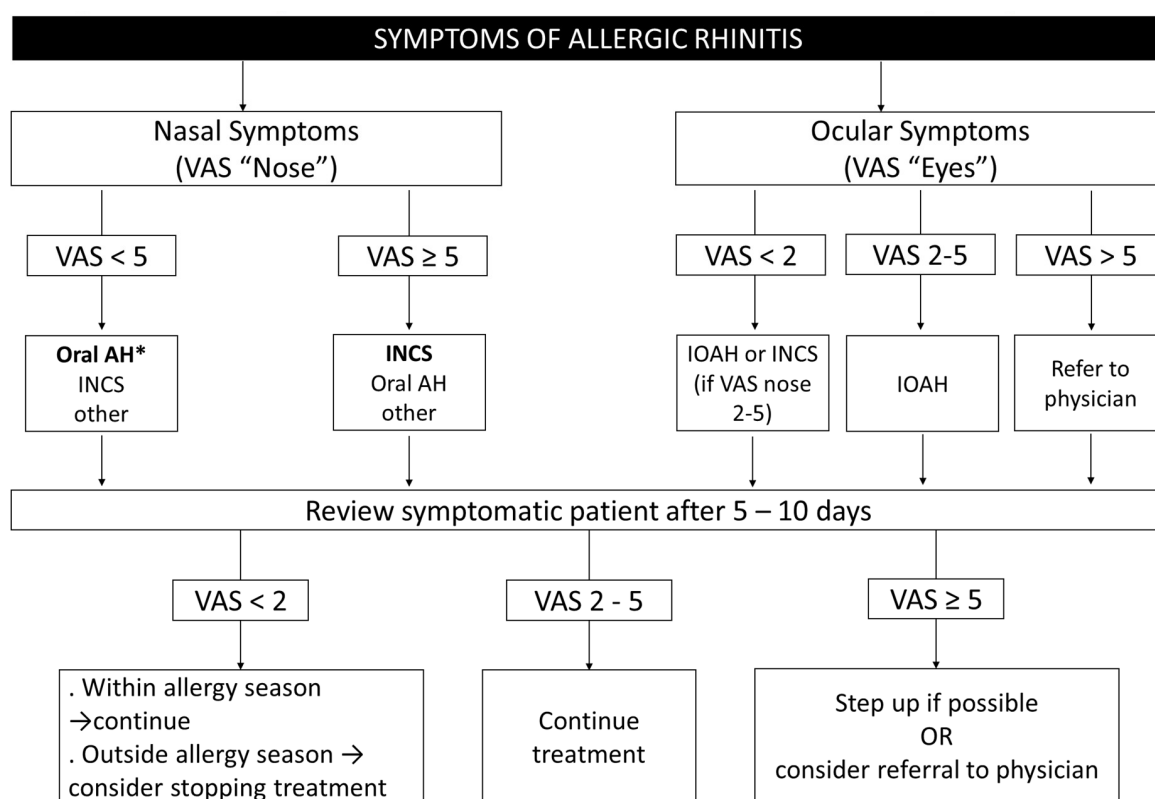


Figure 4. Treatment of allergic rhinitis in the pharmacy. AH, antihistamine; INAH, intranasal antihistamine; INCS, intranasal corticosteroid; IOAH, intraocular antihistamine. *INCS if coexisting asthma (adapted from [22]).

VAS nose: "How much are your nose symptoms bothering you today?"

VAS eyes: "How much are your eye symptoms bothering you today?"

5. Counselling on Possible Side Effects of Medications

Antihistamines and decongestants are frequently used for the treatment of AR [73]. However, pharmacists fulfil a key role in the selection of appropriate self-treatment by patients in the light of possible side effects. Many nonprescribed medications contain first-generation H1 antihistamines (e.g., clemastine, cyproheptadine, hydroxyzine, ketotifen, promethazine) that should be avoided because of their anticholinergic and sedating effects and the related risk of, for example, road accidents [74,75].

Oral decongestants should also be used with caution due to possible side effects, including insomnia, elevated blood pressure, and tachycardia [61].

Intranasal decongestants can be used for short-term and possibly episodic treatment of nasal congestion, but prolonged use may lead to rhinitis medicamentosa (RM) [76]. RM is a form of drug-induced, nonallergic rhinitis caused by the excessive or improper use of topical decongestants. As a result, the patient ends up in a vicious cycle of self-treatment to alleviate nasal congestion [77,78].

A community pharmacy-based study has indicated that overuse of nasal decongestants is prevalent in patients self-medicating persistent rhinitis [79]. Therefore, recommending brief use of fewer than 10 days by the dispensing pharmacist is crucial in the prevention of RM [77,78,80]. Symptoms of RM include long-term redness and swelling of the nasal mucosa and increased runny nose. If this occurs, the patients should be instructed to stop using the medication and consult a physician or a pharmacist.

6. Patient's Self-Management of AR and Patient Support

Self-management plays a particularly important role in the management of AR and is a major challenge for four key reasons—(1) patients often underestimate their symptoms; (2) trivialize their condition; (3) do not adhere to medication; and (4) fail to review treatment to assure that it is working [37,55]. Moreover, there is increased access to medications, especially for long-established prescription drugs with good safety profiles that have been rescheduled as OTC [81]. Furthermore, in some countries, OTC medications may be obtained without the intervention of a pharmacist [37]. Patients should also be educated on when to expect symptom relief. In the case of INCS, the benefit may take up to two days to be clinically evident and several days to be fully effective [82].

AR has a significant impact on individuals, creating an important economic burden with substantial direct (expenditure for medication, hospitalizations, access to medical care) and indirect (absenteeism, presenteeism, decreased school/work performance) costs [83]. Appropriate/optimal self-care and self-management of chronic conditions have been shown to improve adherence, improve disease outcomes and reduce the burden on health services [84–87]. An important aspect of this self-management is the input of healthcare professionals. Healthcare professional-directed goals and strategies in self-management result in better clinical outcomes than goals and strategies derived from personal choice only [11,37,38,88]. Patients need to have their AR and treatment reviewed over time with a healthcare professional.

mHealth tools have conquered the general public and an enormous number of monitoring applications, that are freely available, user friendly and intuitive are currently being used. Self-management, outside the confines of formal healthcare, but supported on mHealth tools, may ensure that the patient is properly informed and educated about his/her disease and can apply a course of action to ensure optimal outcomes [89].

Mobile technology may help to better understand the low adherence to treatment in allergic diseases and asthma [90,91]. Many mobile phone apps are available to support people in taking their medications and to improve medication adherence [92,93]. However, the majority of them do not have many of the desirable features and are of low quality [93].

Adherence is a dynamic phenomenon and optimal adherence is crucial for treatment success. Community pharmacy-led interventions can improve patient adherence to medications and contribute to better COPD and asthma control [67,94]. To the best of our knowledge, no community pharmacy interventions designed specifically to improve AR medication adherence have been published. However, the literature already available in other settings supports the use of educational interventions in the community pharmacy [94].

MASK-air is a very usable app, specific for AR monitoring which has been validated with published results, being implemented in 23 countries and 17 languages [23,24,95,96]. This tool is appropriate for most patients and enables patient follow-up. In addition to being a tool to assist patients, MASK-air can also be used to discuss AR with healthcare providers through the interoperable application MASK-air Companion [97]. Using MASK-air, a patient is able to print out the daily AR

symptoms and share them with the pharmacist (or other healthcare providers). The MASK-air app also encompasses questions related to symptoms, quality of life and work, with a simple interface using VAS [98] and the CARAT questionnaire [23].

7. Conclusions

The integration of all of the stakeholders proposed by ARIA in a common integrated pathway can improve disease outcomes [25,28]. Given the breadth of individuals and resources with whom AR patients are engaged [11], it is critical that an integrated care pathway approach is applied to the management of AR. Shared responsibility among patients, pharmacists, primary care/general practitioners and specialists can ensure appropriate, safe and cost-effective medication use, and lower healthcare utilization rates. The development of this integrated pathway in which the pharmacist is a member of the interdisciplinary team can affect the quality of both the individual healthcare services and the patient's healthcare plan. Moreover, what truly distinguishes the ARIA proposal is that it considers the patient's needs and desired outcomes for their disease and quality of life.

Author Contributions: Conceptualization, O.L., S.B.-A. and J.B.; methodology, O.L., S.B.-A., E.C., J.A.F. and J.B.; writing—original draft preparation, O.L., S.B.-A., A.B. and J.B.; writing—review and editing, O.L., S.B.-A., E.C., J.A.F., E.M., B.C., V.K., R.T., A.B., S.S., C.B., S.B., V.B., K.B., G.W.C., T.H., P.K., E.N., B.S., H.J.S., D.W., and J.B.; supervision, J.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: We would like to express great appreciation to the Allergic Rhinitis and Its Impact on Asthma Working Group for valuable and constructive suggestions during the planning and development of this guide. We are particularly grateful for the assistance given by Adriano Raposo in figure editing.

Conflicts of Interest: O Lourenço, E Costa, JA Fonseca, E Menditto, B Cvetkovski, R Tan, A Bedbrook, S Scheire, C Bachert, S Bialek, V Briedis, K Boussery, GW Canonica have no conflicts of interest to declare. S Bosnic-Anticevich reports grants from TEVA, personal fees from TEVA, Boehringer Ingelheim, Sanofi, GSK, AstraZeneca, outside the submitted work. V Kritikos reports personal fees from AstraZeneca, GlaxoSmithKline, Pfizer, outside the submitted work. T Haahtela reports personal fees from Mundipharma, Novartis, and Orion Pharma, outside the submitted work. P Kuna reports personal fees from Adamed, Boehringer Ingelheim, AstraZeneca, personal fees from Chiesi, FAES, Berlin Chemie, Novartis, Polpharma, Allergopharma, outside the submitted work. D Wallace reports and Indicates that she is the co-chair of the Joint Task Force on Practice Parameters, a task force composed of 12 members of the American Academy of Allergy, Asthma, and Immunology and the American College of Allergy, Asthma, and Immunology. JB reports personal fees and others from Chiesi, Cipla, Hikma, Menarini, Mundipharma, Mylan, Novartis, Sanofi-Aventis, Takeda, Teva, Uriach, others from Kyomed, outside the submitted work.

References

1. Mims, J.W. Epidemiology of allergic rhinitis. *Int. Forum Allergy Rhinol.* **2014**, *4*, S18–S20. [[CrossRef](#)]
2. Meltzer, E.O.; Blaiss, M.S.; Naclerio, R.M.; Stoloff, S.W.; Derebery, M.J.; Nelson, H.S.; Boyle, J.M.; Wingertzahn, M.A. Burden of allergic rhinitis: Allergies in America, Latin America, and Asia-Pacific adult surveys. *Allergy Asthma Proc.* **2012**, *33*, S113–S141. [[CrossRef](#)]
3. Baptist, A.P.; Nyenhuis, S. Rhinitis in the elderly. *Immunol. Allergy Clin. N. Am.* **2016**, *36*, 343–357. [[CrossRef](#)]
4. Hill, D.A.; Grundmeier, R.W.; Ram, G.; Spergel, J.M. The epidemiologic characteristics of healthcare provider-diagnosed eczema, asthma, allergic rhinitis, and food allergy in children: A retrospective cohort study. *BMC Pediatr.* **2016**, *16*, 133. [[CrossRef](#)] [[PubMed](#)]
5. Brozek, J.L.; Bousquet, J.; Agache, I.; Agarwal, A.; Bachert, C.; Bosnic-Anticevich, S.; Brignardello-Petersen, R.; Canonica, G.W.; Casale, T.; Chavannes, N.H.; et al. Allergic rhinitis and its impact on asthma (ARIA) guidelines—2016 revision. *J. Allergy Clin. Immunol.* **2017**, *140*, 950–958. [[CrossRef](#)] [[PubMed](#)]
6. Vandenplas, O.; Vinnikov, D.; Blanc, P.D.; Agache, I.; Bachert, C.; Bewick, M.; Cardell, L.O.; Cullinan, P.; Demoly, P.; Descatha, A.; et al. Impact of rhinitis on work productivity: A systematic review. *J. Allergy Clin. Immunol. Pract.* **2018**, *6*, 1274–1286.e1279. [[CrossRef](#)] [[PubMed](#)]
7. Munoz-Cano, R.; Ribo, P.; Araujo, G.; Giral, E.; Sanchez-Lopez, J.; Valero, A. Severity of allergic rhinitis impacts sleep and anxiety: Results from a large Spanish cohort. *Clin. Transl. Allergy* **2018**, *8*, 23. [[CrossRef](#)]

8. Hoehle, L.P.; Speth, M.M.; Phillips, K.M.; Gaudin, R.A.; Caradonna, D.S.; Gray, S.T.; Sedaghat, A.R. Association between symptoms of allergic rhinitis with decreased general health-related quality of life. *Am. J. Rhinol. Allergy* **2017**, *31*, 235–239. [[CrossRef](#)]
9. Meltzer, E.O. Allergic rhinitis: Burden of illness, quality of life, comorbidities, and control. *Immunol. Allergy Clin. N. Am.* **2016**, *36*, 235–248. [[CrossRef](#)]
10. Bachert, C.; Bousquet, J.; Hellings, P. Rapid onset of action and reduced nasal hyperreactivity: New targets in allergic rhinitis management. *Clin. Transl. Allergy* **2018**, *8*, 25. [[CrossRef](#)]
11. Cvetkovski, B.; Kritikos, V.; Yan, K.; Bosnic-Anticevich, S. Tell me about your hay fever: A qualitative investigation of allergic rhinitis management from the perspective of the patient. *NPJ Prim. Care Respir. Med.* **2018**, *28*, 3. [[CrossRef](#)] [[PubMed](#)]
12. Williams, A.; Scadding, G. Is reliance on self-medication and pharmacy care adequate for rhinitis patients? *Int. J. Clin. Pract.* **2009**, *63*, 98–104. [[CrossRef](#)] [[PubMed](#)]
13. Kuehl, B.L.; Abdunour, S.; O'Dell, M.; Kyle, T.K. Understanding the role of the healthcare professional in patient self-management of allergic rhinitis. *SAGE Open Med.* **2015**, *3*, 2050312115595822. [[CrossRef](#)] [[PubMed](#)]
14. Bosnic-Anticevich, S.; Kritikos, V.; Carter, V.; Yan, K.Y.; Armour, C.; Ryan, D.; Price, D. Lack of asthma and rhinitis control in general practitioner-managed patients prescribed fixed-dose combination therapy in Australia. *J. Asthma* **2018**, *55*, 684–694. [[CrossRef](#)] [[PubMed](#)]
15. Menditto, E.; Cahir, C.; Aza-Pascual-Salcedo, M.; Bruzzese, D.; Poblador-Plou, B.; Malo, S.; Costa, E.; Gonzalez-Rubio, F.; Gimeno-Miguel, A.; Orlando, V.; et al. Adherence to chronic medication in older populations: Application of a common protocol among three European cohorts. *Patient Prefer. Adherence* **2018**, *12*, 1975–1987. [[CrossRef](#)]
16. Menditto, E.; Costa, E.; Midao, L.; Bosnic-Anticevich, S.; Novellino, E.; Bialek, S.; Briedis, V.; Mair, A.; Rajabian-Soderlund, R.; Arnavielhe, S.; et al. Adherence to treatment in allergic rhinitis using mobile technology. The MASK Study. *Clin. Exp. Allergy* **2019**, *49*, 442–460. [[CrossRef](#)]
17. Bousquet, J.; Devillier, P.; Anto, J.M.; Bewick, M.; Hahtela, T.; Arnavielhe, S.; Bedbrook, A.; Murray, R.; van Eerd, M.; Fonseca, J.A.; et al. Daily allergic multimorbidity in rhinitis using mobile technology: A novel concept of the MASK study. *Allergy* **2018**, *73*, 1622–1631. [[CrossRef](#)]
18. Bousquet, J.; Khaltaev, N.; Cruz, A.A.; Denburg, J.; Fokkens, W.J.; Togias, A.; Zuberbier, T.; Baena-Cagnani, C.E.; Canonica, G.W.; van Weel, C.; et al. Allergic rhinitis and its impact on asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA(2)LEN and AllerGen). *Allergy* **2008**, *63*, 8–160. [[CrossRef](#)]
19. Bousquet, J.; Van Cauwenberge, P.; Khaltaev, N.; Aria Workshop, G.; World Health, O. Allergic rhinitis and its impact on asthma. *J. Allergy Clin. Immunol.* **2001**, *108*, S147–S334. [[CrossRef](#)]
20. Brozek, J.L.; Bousquet, J.; Baena-Cagnani, C.E.; Bonini, S.; Canonica, G.W.; Casale, T.B.; van Wijk, R.G.; Ohta, K.; Zuberbier, T.; Schunemann, H.J.; et al. Allergic rhinitis and its impact on asthma (ARIA) guidelines: 2010 revision. *J. Allergy Clin. Immunol.* **2010**, *126*, 466–476. [[CrossRef](#)]
21. Members of the Workshops. ARIA in the pharmacy: Management of allergic rhinitis symptoms in the pharmacy. Allergic rhinitis and its impact on asthma. *Allergy* **2004**, *59*, 373–387. [[CrossRef](#)] [[PubMed](#)]
22. Bosnic-Anticevich, S.; Costa, E.; Menditto, E.; Lourenco, O.; Novellino, E.; Bialek, S.; Briedis, V.; Buonaiuto, R.; Chrystyn, H.; Cvetkovski, B.; et al. ARIA pharmacy 2018 “Allergic rhinitis care pathways for community pharmacy”: AIRWAYS ICPs initiative (European Innovation Partnership on Active and Healthy Ageing, DG CONNECT and DG Sante) POLLAR (Impact of Air POLLution on Asthma and Rhinitis) GARD Demonstration project. *Allergy* **2019**, *74*, 1219–1236. [[CrossRef](#)] [[PubMed](#)]
23. Bousquet, J.; Hellings, P.W.; Agache, I.; Bedbrook, A.; Bachert, C.; Bergmann, K.C.; Bewick, M.; Bindeslev-Jensen, C.; Bosnic-Anticevich, S.; Bucca, C.; et al. ARIA 2016: Care pathways implementing emerging technologies for predictive medicine in rhinitis and asthma across the life cycle. *Clin. Transl. Allergy* **2016**, *6*, 47. [[CrossRef](#)] [[PubMed](#)]
24. Bousquet, J.; Arnavielhe, S.; Bedbrook, A.; Bewick, M.; Laune, D.; Mathieu-Dupas, E.; Murray, R.; Onorato, G.L.; Pepin, J.L.; Picard, R.; et al. MASK 2017: ARIA digitally-enabled, integrated, person-centred care for rhinitis and asthma multimorbidity using real-world-evidence. *Clin. Transl. Allergy* **2018**, *8*, 45. [[CrossRef](#)] [[PubMed](#)]

25. Bousquet, J.; Bedbrook, A.; Czarlewski, W.; Onorato, G.L.; Arnavielhe, S.; Laune, D.; Mathieu-Dupas, E.; Fonseca, J.; Costa, E.; Lourenco, O.; et al. Guidance to 2018 good practice: ARIA digitally-enabled, integrated, person-centred care for rhinitis and asthma. *Clin. Transl. Allergy* **2019**, *9*, 16. [\[CrossRef\]](#)
26. European Innovation Partnership on Active and Healthy Ageing Action Plan B3; Mechanisms of the Development of Allergy WP10; Global Alliance against Chronic Respiratory Diseases; Bousquet, J.; Addis, A.; Adcock, I.; Agache, I.; Agusti, A.; Alonso, A.; Annesi-Maesano, I.; et al. Integrated care pathways for airway diseases (AIRWAYS-ICPs). *Eur. Respir. J.* **2014**, *44*, 304–323. [\[CrossRef\]](#)
27. Bousquet, J.; Barbara, C.; Bateman, E.; Bel, E.; Bewick, M.; Chavannes, N.H.; Cruz, A.A.; Haahtela, T.; Hellings, P.W.; Khaltayev, N.; et al. AIRWAYS-ICPs (European Innovation Partnership on Active and Healthy Ageing) from concept to implementation. *Eur. Respir. J.* **2016**, *47*, 1028–1033. [\[CrossRef\]](#)
28. Bousquet, J.J.; Schunemann, H.J.; Togias, A.; Erhola, M.; Hellings, P.W.; Zuberbier, T.; Agache, I.; Ansotegui, I.J.; Anto, J.M.; Bachert, C.; et al. Next-generation ARIA care pathways for rhinitis and asthma: A model for multimorbid chronic diseases. *Clin. Transl. Allergy* **2019**, *9*, 44. [\[CrossRef\]](#)
29. Bousquet, J.; Schunemann, H.J.; Togias, A.; Bachert, C.; Erhola, M.; Hellings, P.W.; Klimek, L.; Pfaar, O.; Wallace, D.; Ansotegui, I.; et al. Next-generation allergic rhinitis and its impact on asthma (ARIA) guidelines for allergic rhinitis based on grading of recommendations assessment, development and evaluation (GRADE) and real-world evidence. *J. Allergy Clin. Immunol.* **2019**. [\[CrossRef\]](#)
30. Bousquet, J.; Farrell, J.; Crooks, G.; Hellings, P.; Bel, E.H.; Bewick, M.; Chavannes, N.H.; de Sousa, J.C.; Cruz, A.A.; Haahtela, T.; et al. Scaling up strategies of the chronic respiratory disease programme of the European innovation partnership on active and healthy ageing (Action Plan B3: Area 5). *Clin. Transl. Allergy* **2016**, *6*, 29. [\[CrossRef\]](#)
31. Bousquet, J.; Agache, I.; Aliberti, M.R.; Angles, R.; Annesi-Maesano, I.; Anto, J.M.; Arnavielhe, S.; Asayag, E.; Bacci, E.; Bedbrook, A.; et al. Transfer of innovation on allergic rhinitis and asthma multimorbidity in the elderly (MACVIA-ARIA)—EIP on AHA twinning reference site (GARD research demonstration project). *Allergy* **2018**, *73*, 77–92. [\[CrossRef\]](#) [\[PubMed\]](#)
32. Valiulis, A.; Bousquet, J.; Veryga, A.; Suprun, U.; Sergeenko, D.; Cebotari, S.; Borelli, D.; Pietikainen, S.; Banys, J.; Agache, I.; et al. Vilnius declaration on chronic respiratory diseases: Multisectoral care pathways embedding guided self-management, mHealth and air pollution in chronic respiratory diseases. *Clin. Transl. Allergy* **2019**, *9*, 7. [\[CrossRef\]](#) [\[PubMed\]](#)
33. Bousquet, J.; Hellings, P.W.; Agache, I.; Amat, F.; Annesi-Maesano, I.; Ansotegui, I.J.; Anto, J.M.; Bachert, C.; Bateman, E.D.; Bedbrook, A.; et al. Allergic rhinitis and its impact on asthma (ARIA) phase 4 (2018): Change management in allergic rhinitis and asthma multimorbidity using mobile technology. *J. Allergy Clin. Immunol.* **2019**, *143*, 864–879. [\[CrossRef\]](#)
34. Wallace, D.V.; Dykewicz, M.S. Seasonal allergic rhinitis: A focused systematic review and practice parameter update. *Curr. Opin. Allergy Clin. Immunol.* **2017**, *17*, 286–294. [\[CrossRef\]](#) [\[PubMed\]](#)
35. Tan, R.; Cvetkovski, B.; Kritikos, V.; Price, D.; Yan, K.; Smith, P.; Bosnic-Anticevich, S. The burden of rhinitis and the impact of medication management within the community pharmacy setting. *J. Allergy Clin. Immunol. Pract.* **2018**, *6*, 1717–1725. [\[CrossRef\]](#) [\[PubMed\]](#)
36. Bousquet, P.J.; Bachert, C.; Canonica, G.W.; Casale, T.B.; Mullol, J.; Klossek, J.M.; Zuberbier, T.; Bousquet, J. Uncontrolled allergic rhinitis during treatment and its impact on quality of life: A cluster randomized trial. *J. Allergy Clin. Immunol.* **2010**, *126*, 666–668.e5. [\[CrossRef\]](#) [\[PubMed\]](#)
37. Tan, R.; Cvetkovski, B.; Kritikos, V.; Price, D.; Yan, K.; Smith, P.; Bosnic-Anticevich, S. Identifying the hidden burden of allergic rhinitis (AR) in community pharmacy: A global phenomenon. *Asthma Res. Pract.* **2017**, *3*, 8. [\[CrossRef\]](#)
38. Fokkens, W.J.; Lund, V.J.; Mullol, J.; Bachert, C.; Alobid, I.; Baroody, F.; Cohen, N.; Cervin, A.; Douglas, R.; Gevaert, P.; et al. EPOS 2012: European position paper on rhinosinusitis and nasal polyps 2012. A summary for otorhinolaryngologists. *Rhinology* **2012**, *50*, 1–12. [\[CrossRef\]](#)
39. Shaaban, R.; Zureik, M.; Soussan, D.; Neukirch, C.; Heinrich, J.; Sunyer, J.; Wjst, M.; Cerveri, I.; Pin, I.; Bousquet, J.; et al. Rhinitis and onset of asthma: A longitudinal population-based study. *Lancet* **2008**, *372*, 1049–1057. [\[CrossRef\]](#)
40. Bousquet, J.; Fokkens, W.; Burney, P.; Durham, S.R.; Bachert, C.; Akdis, C.A.; Canonica, G.W.; Dahlen, S.E.; Zuberbier, T.; Bieber, T.; et al. Important research questions in allergy and related diseases: Nonallergic rhinitis: A GA2LEN paper. *Allergy* **2008**, *63*, 842–853. [\[CrossRef\]](#)

41. Leonardi, A.; Castegnaro, A.; Valerio, A.L.; Lazzarini, D. Epidemiology of allergic conjunctivitis: Clinical appearance and treatment patterns in a population-based study. *Curr. Opin. Allergy Clin. Immunol.* **2015**, *15*, 482–488. [[CrossRef](#)] [[PubMed](#)]
42. Navarro, A.; Valero, A.; Julia, B.; Quirce, S. Coexistence of asthma and allergic rhinitis in adult patients attending allergy clinics: ONEAIR study. *J. Investig. Allergol. Clin. Immunol.* **2008**, *18*, 233–238. [[PubMed](#)]
43. Ciprandi, G.; Cirillo, I.; Signori, A. Impact of allergic rhinitis on bronchi: An 8-year follow-up study. *Am. J. Rhinol. Allergy* **2011**, *25*, e72–e76. [[CrossRef](#)] [[PubMed](#)]
44. Clatworthy, J.; Price, D.; Ryan, D.; Haughney, J.; Horne, R. The value of self-report assessment of adherence, rhinitis and smoking in relation to asthma control. *Prim. Care Respir. J.* **2009**, *18*, 300–305. [[CrossRef](#)]
45. Bousquet, J.; Pfaar, O.; Togias, A.; Schunemann, H.J.; Ansotegui, I.; Papadopoulos, N.G.; Tsiligianni, I.; Agache, I.; Anto, J.M.; Bachert, C.; et al. 2019 ARIA Care pathways for allergen immunotherapy. *Allergy* **2019**. [[CrossRef](#)] [[PubMed](#)]
46. Silverman, J.B.; Stapinski, C.D.; Huber, C.; Ghandi, T.K.; Churchill, W.W. Computer-based system for preventing adverse drug events. *Am. J. Health Syst. Pharm.* **2004**, *61*, 1599–1603. [[CrossRef](#)]
47. Ajami, S.; Amini, F. Evaluate the ability of clinical decision support systems (CDSSs) to improve clinical practice. *Med. Arch.* **2013**, *67*, 126–130. [[CrossRef](#)]
48. Hwang, S.H.; Lee, S.; Koo, H.K.; Kim, Y. Evaluation of a computer-based adverse-drug-event monitor. *Am. J. Health Syst. Pharm.* **2008**, *65*, 2265–2272. [[CrossRef](#)]
49. Liu, Y.L.; Chu, L.L.; Su, H.C.; Tsai, K.T.; Kao, P.H.; Chen, J.F.; Hsieh, H.C.; Lin, H.J.; Hsu, C.C.; Huang, C.C. Impact of computer-based and pharmacist-assisted medication review initiated in the emergency department. *J. Am. Geriatr. Soc.* **2019**, *67*, 2298–2304. [[CrossRef](#)]
50. Bertsche, T.; Nachbar, M.; Fiederling, J.; Schmitt, S.P.; Kaltschmidt, J.; Seidling, H.M.; Haefeli, W.E. Assessment of a computerised decision support system for allergic rhino-conjunctivitis counselling in German pharmacy. *Int. J. Clin. Pharm.* **2012**, *34*, 17–22. [[CrossRef](#)]
51. Courbis, A.L.; Murray, R.B.; Arnavielhe, S.; Caimmi, D.; Bedbrook, A.; Van Eerd, M.; De Vries, G.; Dray, G.; Agache, I.; Morais-Almeida, M.; et al. Electronic clinical decision support system for allergic rhinitis management: MASK e-CDSS. *Clin. Exp. Allergy* **2018**, *48*, 1640–1653. [[CrossRef](#)] [[PubMed](#)]
52. Demoly, P.; Bousquet, P.J.; Mesbah, K.; Bousquet, J.; Devillier, P. Visual analogue scale in patients treated for allergic rhinitis: An observational prospective study in primary care: Asthma and rhinitis. *Clin. Exp. Allergy* **2013**, *43*, 881–888. [[CrossRef](#)] [[PubMed](#)]
53. Bousquet, P.J.; Demoly, P.; Devillier, P.; Mesbah, K.; Bousquet, J. Impact of allergic rhinitis symptoms on quality of life in primary care. *Int. Arch. Allergy Immunol.* **2013**, *160*, 393–400. [[CrossRef](#)] [[PubMed](#)]
54. Azevedo, P.; Correia de Sousa, J.; Bousquet, J.; Bugalho-Almeida, A.; Del Giacco, S.R.; Demoly, P.; Haahtela, T.; Jacinto, T.; Garcia-Larsen, V.; van der Molen, T.; et al. Control of allergic rhinitis and asthma test (CARAT): Dissemination and applications in primary care. *Prim. Care Respir. J.* **2013**, *22*, 112–116. [[CrossRef](#)]
55. Lourenco, O.; Calado, S.; Sa-Sousa, A.; Fonseca, J. Evaluation of allergic rhinitis and asthma control in a Portuguese community pharmacy setting. *J. Manag. Care Spec. Pharm.* **2014**, *20*, 513–522. [[CrossRef](#)] [[PubMed](#)]
56. Wise, S.K.; Lin, S.Y.; Toskala, E.; Orlandi, R.R.; Akdis, C.A.; Alt, J.A.; Azar, A.; Baroody, F.M.; Bachert, C.; Canonica, G.W.; et al. International consensus statement on allergy and rhinology: Allergic rhinitis. *Int. Forum Allergy Rhinol.* **2018**, *8*, 108–352. [[CrossRef](#)] [[PubMed](#)]
57. Seidman, M.D.; Gurgel, R.K.; Lin, S.Y.; Schwartz, S.R.; Baroody, F.M.; Bonner, J.R.; Dawson, D.E.; Dykewicz, M.S.; Hackell, J.M.; Han, J.K.; et al. Clinical practice guideline: Allergic rhinitis. *Otolaryngol. Head Neck Surg.* **2015**, *152*, S1–S43. [[CrossRef](#)]
58. Angier, E.; Willington, J.; Scadding, G.; Holmes, S.; Walker, S. Management of allergic and non-allergic rhinitis: A primary care summary of the BSACI guideline. *Prim. Care Respir. J.* **2010**, *19*, 217–222. [[CrossRef](#)]
59. Roberts, G.; Xatzipsalti, M.; Borrego, L.M.; Custovic, A.; Halken, S.; Hellings, P.W.; Papadopoulos, N.G.; Rotiroti, G.; Scadding, G.; Timmermans, F.; et al. Paediatric rhinitis: Position paper of the European Academy of Allergy and Clinical Immunology. *Allergy* **2013**, *68*, 1102–1116. [[CrossRef](#)]
60. Benninger, M.; Farrar, J.R.; Blaiss, M.; Chipps, B.; Ferguson, B.; Krouse, J.; Marple, B.; Storms, W.; Kaliner, M. Evaluating approved medications to treat allergic rhinitis in the United States: An evidence-based review of efficacy for nasal symptoms by class. *Ann. Allergy Asthma Immunol.* **2010**, *104*, 13–29. [[CrossRef](#)]
61. May, J.R.; Dolen, W.K. Management of allergic rhinitis: A review for the community pharmacist. *Clin. Ther.* **2017**, *39*, 2410–2419. [[CrossRef](#)]

62. Carter, A.; Dattani, N.; Hannan, S.A. Chronic rhinosinusitis. *BMJ* **2019**, *364*, l131. [[CrossRef](#)]
63. Sher, E.R.; Ross, J.A. Intranasal corticosteroids: The role of patient preference and satisfaction. *Allergy Asthma Proc.* **2014**, *35*, 24–33. [[CrossRef](#)] [[PubMed](#)]
64. Yanez, A.; Dimitroff, A.; Bremner, P.; Rhee, C.S.; Luscombe, G.; Prillaman, B.A.; Johnson, N. A patient preference study that evaluated fluticasone furoate and mometasone furoate nasal sprays for allergic rhinitis. *Allergy Rhinol.* **2016**, *7*, 183–192. [[CrossRef](#)] [[PubMed](#)]
65. Ruud, K.W.; Ronningen, S.W.; Faksvag, P.K.; Ariansen, H.; Hovland, R. Evaluation of a structured pharmacist-led inhalation technique assessment service for patients with asthma and COPD in Norwegian pharmacies. *Patient Educ. Couns.* **2018**, *101*, 1828–1837. [[CrossRef](#)] [[PubMed](#)]
66. Apikoglu-Rabus, S.; Yesilyaprak, G.; Izzettin, F.V. Drug-related problems and pharmacist interventions in a cohort of patients with asthma and chronic obstructive pulmonary disease. *Respir. Med.* **2016**, *120*, 109–115. [[CrossRef](#)]
67. Tommelein, E.; Mehuys, E.; Van Hees, T.; Adriaens, E.; Van Bortel, L.; Christiaens, T.; Van Tongelen, I.; Remon, J.P.; Boussery, K.; Brusselle, G. Effectiveness of pharmaceutical care for patients with chronic obstructive pulmonary disease (PHARMACOP): A randomized controlled trial. *Br. J. Clin. Pharmacol.* **2014**, *77*, 756–766. [[CrossRef](#)]
68. McLean, W.M.; MacKeigan, L.D. When does pharmaceutical care impact health outcomes? A comparison of community pharmacy-based studies of pharmaceutical care for patients with asthma. *Ann. Pharmacother.* **2005**, *39*, 625–631. [[CrossRef](#)]
69. Ganesh, V.; Banigo, A.; McMurran, A.E.L.; Shakeel, M.; Ram, B. Does intranasal steroid spray technique affect side effects and compliance? Results of a patient survey. *J. Laryngol. Otol.* **2017**, *131*, 991–996. [[CrossRef](#)]
70. Williams, P.B.; Crandall, E.; Sheppard, J.D. Azelastine hydrochloride, a dual-acting anti-inflammatory ophthalmic solution, for treatment of allergic conjunctivitis. *Clin. Ophthalmol.* **2010**, *4*, 993–1001. [[CrossRef](#)]
71. Berger, W.; Bousquet, J.; Fox, A.T.; Just, J.; Muraro, A.; Nieto, A.; Valovirta, E.; Wickman, M.; Wahn, U. Azelastine/fluticasone propionate (Dymista) for seasonal allergic rhinitis. *Med. Lett. Drugs Ther.* **2012**, *54*, 85–87.
72. Bousquet, J.; Bachert, C.; Bernstein, J.; Canonica, G.W.; Carr, W.; Dahl, R.; Demoly, P.; Devillier, P.; Hellings, P.; Fokkens, W.; et al. Advances in pharmacotherapy for the treatment of allergic rhinitis; MP29-02 (a novel formulation of azelastine hydrochloride and fluticasone propionate in an advanced delivery system) fills the gaps. *Expert Opin. Pharmacother.* **2015**, *16*, 913–928. [[CrossRef](#)] [[PubMed](#)]
73. Lombardi, C.; Musicco, E.; Rastrelli, F.; Bettoncelli, G.; Passalacqua, G.; Canonica, G.W. The patient with rhinitis in the pharmacy. A cross-sectional study in real life. *Asthma Res. Pract.* **2015**, *1*, 4. [[CrossRef](#)] [[PubMed](#)]
74. Church, M.K.; Maurer, M.; Simons, F.E.; Bindeslev-Jensen, C.; van Cauwenberge, P.; Bousquet, J.; Holgate, S.T.; Zuberbier, T.; Global Allergy and Asthma European Network. Risk of first-generation H(1)-antihistamines: A GA(2)LEN position paper. *Allergy* **2010**, *65*, 459–466. [[CrossRef](#)]
75. Van Driel, M.L.; Scheire, S.; Deckx, L.; Gevaert, P.; De Sutter, A. What treatments are effective for common cold in adults and children? *BMJ* **2018**, *363*, k3786. [[CrossRef](#)]
76. Wallace, D.V.; Dykewicz, M.S.; Bernstein, D.I.; Blessing-Moore, J.; Cox, L.; Khan, D.A.; Lang, D.M.; Nicklas, R.A.; Oppenheimer, J.; Portnoy, J.M.; et al. The diagnosis and management of rhinitis: An updated practice parameter. *J. Allergy Clin. Immunol.* **2008**, *122*, S1–S84. [[CrossRef](#)]
77. Graf, P. Rhinitis medicamentosa: A review of causes and treatment. *Treat. Respir. Med.* **2005**, *4*, 21–29. [[CrossRef](#)]
78. Ramey, J.T.; Bailen, E.; Lockey, R.F. Rhinitis medicamentosa. *J. Investig. Allergol. Clin. Immunol.* **2006**, *16*, 148–155.
79. Mehuys, E.; Gevaert, P.; Brusselle, G.; Van Hees, T.; Adriaens, E.; Christiaens, T.; Van Bortel, L.; Van Tongelen, I.; Remon, J.P.; Boussery, K. Self-medication in persistent rhinitis: Overuse of decongestants in half of the patients. *J. Allergy Clin. Immunol. Pract.* **2014**, *2*, 313–319. [[CrossRef](#)]
80. Meltzer, E.O.; Caballero, F.; Fromer, L.M.; Krouse, J.H.; Scadding, G. Treatment of congestion in upper respiratory diseases. *Int. J. Gen. Med.* **2010**, *3*, 69–91. [[CrossRef](#)]
81. Rachelefsky, G.; Farrar, J.R. Are you comfortable with over-the-counter intranasal steroids for children? A call to action. *J. Allergy Clin. Immunol. Pract.* **2014**, *2*, 271–274. [[CrossRef](#)] [[PubMed](#)]

82. van Cauwenberge, P.; Bachert, C.; Passalacqua, G.; Bousquet, J.; Canonica, G.W.; Durham, S.R.; Fokkens, W.J.; Howarth, P.H.; Lund, V.; Malling, H.J.; et al. Consensus statement on the treatment of allergic rhinitis. European Academy of Allergology and Clinical Immunology. *Allergy* **2000**, *55*, 116–134. [[CrossRef](#)] [[PubMed](#)]
83. Cardell, L.O.; Olsson, P.; Andersson, M.; Welin, K.O.; Svensson, J.; Tennvall, G.R.; Hellgren, J. TOTALL: High cost of allergic rhinitis—a national Swedish population-based questionnaire study. *NPJ Prim. Care Respir. Med.* **2016**, *26*, 15082. [[CrossRef](#)] [[PubMed](#)]
84. Pinnock, H. Supported self-management for asthma. *Breathe* **2015**, *11*, 98–109. [[CrossRef](#)]
85. Lenferink, A.; Brusse-Keizer, M.; van der Valk, P.D.; Frith, P.A.; Zwerink, M.; Monninkhof, E.M.; van der Palen, J.; Effing, T.W. Self-management interventions including action plans for exacerbations versus usual care in patients with chronic obstructive pulmonary disease. *Cochrane Database Syst. Rev.* **2017**, *8*, CD011682. [[CrossRef](#)]
86. Grady, P.A.; Gough, L.L. Self-management: A comprehensive approach to management of chronic conditions. *Am. J. Public Health* **2014**, *104*, e25–e31. [[CrossRef](#)]
87. Andrews, K.L.; Jones, S.C.; Mullan, J. Asthma self management in adults: A review of current literature. *Collegian* **2014**, *21*, 33–41. [[CrossRef](#)]
88. O'Connor, J.; Seeto, C.; Saini, B.; Bosnic-Anticevich, S.; Krass, I.; Armour, C.; Smith, L. Healthcare professional versus patient goal setting in intermittent allergic rhinitis. *Patient Educ. Couns.* **2008**, *70*, 111–117. [[CrossRef](#)]
89. McCabe, C.; McCann, M.; Brady, A.M. Computer and mobile technology interventions for self-management in chronic obstructive pulmonary disease. *Cochrane Database Syst. Rev.* **2017**, *5*, CD011425. [[CrossRef](#)]
90. Makhinova, T.; Barner, J.C.; Richards, K.M.; Rascati, K.L. Asthma controller medication adherence, risk of exacerbation, and use of rescue agents among Texas medicaid patients with persistent asthma. *J. Manag. Care Spec. Pharm.* **2015**, *21*, 1124–1132. [[CrossRef](#)]
91. Hasford, J.; Uricher, J.; Tauscher, M.; Bramlage, P.; Virchow, J.C. Persistence with asthma treatment is low in Germany especially for controller medication—A population based study of 483,051 patients. *Allergy* **2010**, *65*, 347–354. [[CrossRef](#)] [[PubMed](#)]
92. Thakkar, J.; Kurup, R.; Laba, T.L.; Santo, K.; Thiagalingam, A.; Rodgers, A.; Woodward, M.; Redfern, J.; Chow, C.K. Mobile telephone text messaging for medication adherence in chronic disease: A meta-analysis. *JAMA Intern. Med.* **2016**, *176*, 340–349. [[CrossRef](#)] [[PubMed](#)]
93. Santo, K.; Richtering, S.S.; Chalmers, J.; Thiagalingam, A.; Chow, C.K.; Redfern, J. Mobile phone apps to improve medication adherence: A systematic stepwise process to identify high-quality apps. *JMIR mHealth uHealth* **2016**, *4*, e132. [[CrossRef](#)] [[PubMed](#)]
94. Milosavljevic, A.; Aspden, T.; Harrison, J. Community pharmacist-led interventions and their impact on patients' medication adherence and other health outcomes: A systematic review. *Int. J. Pharm. Pract.* **2018**, *26*, 387–397. [[CrossRef](#)]
95. Bousquet, J.; Bewick, M.; Arnavielhe, S.; Mathieu-Dupas, E.; Murray, R.; Bedbrook, A.; Caimmi, D.P.; Vandenplas, O.; Hellings, P.W.; Bachert, C.; et al. Work productivity in rhinitis using cell phones: The MASK pilot study. *Allergy* **2017**, *72*, 1475–1484. [[CrossRef](#)]
96. Bousquet, J.; Arnavielhe, S.; Bedbrook, A.; Fonseca, J.; Morais Almeida, M.; Todo Bom, A.; Annesi-Maesano, I.; Caimmi, D.; Demoly, P.; Devillier, P.; et al. The allergic rhinitis and its impact on asthma (ARIA) score of allergic rhinitis using mobile technology correlates with quality of life: The MASK study. *Allergy* **2018**, *73*, 505–510. [[CrossRef](#)]
97. Bourret, R.; Bousquet, J.; Mercier, J.; Camuzat, T.; Bedbrook, A.; Demoly, P.; Caimmi, D.; Laune, D.; Arnavielhe, S. MASK-rhinitis, a single tool for integrated care pathways in allergic rhinitis. *World Hosp. Health Serv.* **2015**, *51*, 36–39.
98. Bousquet, P.J.; Combescure, C.; Neukirch, F.; Klossek, J.M.; Mechin, H.; Daures, J.P.; Bousquet, J. Visual analog scales can assess the severity of rhinitis graded according to ARIA guidelines. *Allergy* **2007**, *62*, 367–372. [[CrossRef](#)]

